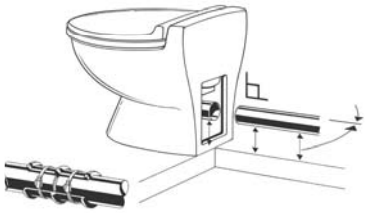
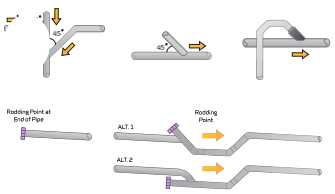
Vacuum Piping Guide
Maritime





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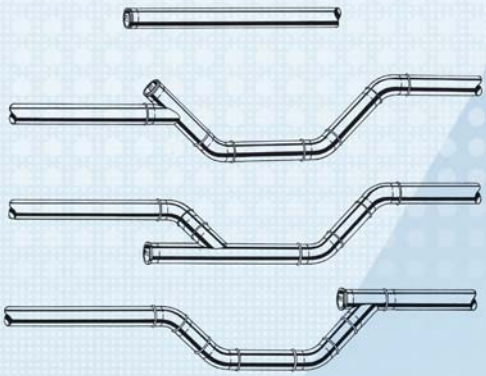
Dictionary

Accumulating tank	For small systems with short distance piping, a vacuum accumulating tank may be needed. An accumulating tank is recommended if the total pipe volume is less than 160 litres (approx. 85 metres of DN50 pipe).
Atmospheric pressure	Air pressure at sea level
Backflow	Sewage from upper pipes flowing back to the rising pipe connected to the toilet.
Branches	Branches are connected to main pipes. We recommend system design with short horizontal branches. In larger systems we recommend shut-off valves for each branch.
Black water	Industry name for sewage, normally from toilets and urinals. The name is used to distinguish from grey water.
Collecting tank	Tank for collecting black water, and sometimes grey water, from a vacuum system.
Discharge pumps	Discharge pumps are mainly used for overboard discharge of content from collecting tanks. They can be supplied in different types and capacities.
Gooseneck	Upward connection loop, to prevent backflow ref. page 26.
Grey water interface unit	Also known as a grey water interface tank. A tank used to interface grey water outlets from showers, wash basins etc. with a vacuum system. Fitted with a CD or ED valve and level sensor for valve activation and tank discharge. Normal sizes are 8, 12 and 16 liters..
Holding tank	Tank for holding (storing) blackwater, and greywater, from a vacuum system.
Rodding point	To be installed with suitable distances and sufficient access. In longer stretches of pipes install in connection with transport pockets.
Sewage treatment plant - STP	Plant for treatment of black water, and grey water, prior to overboard discharge (from ships) or release back into the ecosystem (on land).
Slope	Horizontal pipe with a downward angle.
Slug	Water and effluent from toilets, collected in transport pockets.
Transport pocket	Pocket created to to re-form slug. When a toilet on the same pipeline is flushed the pressure difference in front of and at the back of the pocket will push the slug on to the next pocket.
Vacuum	Any air pressure below atmospheric pressure, often described in percentages of total vacuum. Our CVS™ systems generally operate between 40 - 55% vacuum.
Vacuum system	A complete system consisting of vacuum pipes, vacuum unit, vacuum toilets and in some cases also interface units for grey water and urinals.
Vacuumarator™ pump	A vacuum generator developed by Jets™. Generates vacuum and macerates and transports sewage in a single-pass operation. The Vacuumarator™ pump is a purpose-built design based on the Helivac™ pump principle.

1
Introduction



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1.0 Terms and Conditions

The Jets™ vacuum piping guide is considered a guideline only, and is intended to assist pipeline designers to avoid design errors. It is not to be used as a complete instruction. Pipelines are the building yard/installer`s responsibility, and Jets AS can not be held responsible for any malfunction of the system due to incorrect pipeline design or construction. This is a guideline for all ships with the exception of cruise-ships.

1.1 Introduction

This vacuum piping guide provides information on piping for vacuum sewage as well as waste water pipes connected to such systems. The vacuum piping must be in accordance with vacuum sewage system transportation principles. During transport through the piping system, the slug is affected by gravity and will level out when the toilet valve closes. For this reason it is necessary to have transport pockets in the pipe system where the slug can re-form. Pipes are to be secured by clamps, and rodding points are to be made where convenient.

1.2 Standards and Regulations

See national shipyard standards for vacuum toilet systems. This manual is our recommendation for pipe installations. Each country follows its own national standards and regulations.

1.3 Support

Please contact:

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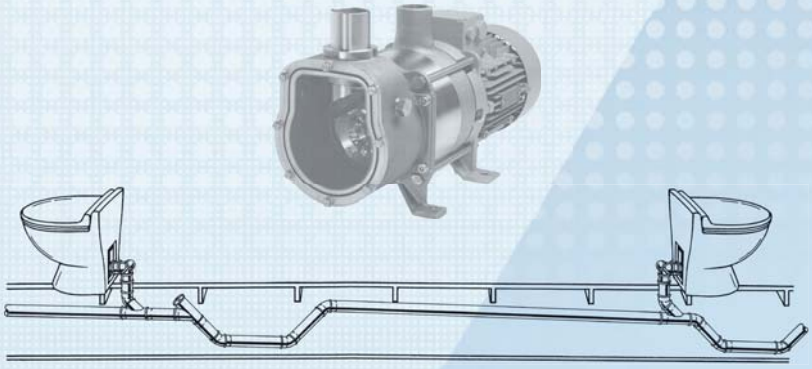
2
System Description



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2.0 Vacuum Toilet System

A Jets AS vacuum toilet system consists of:

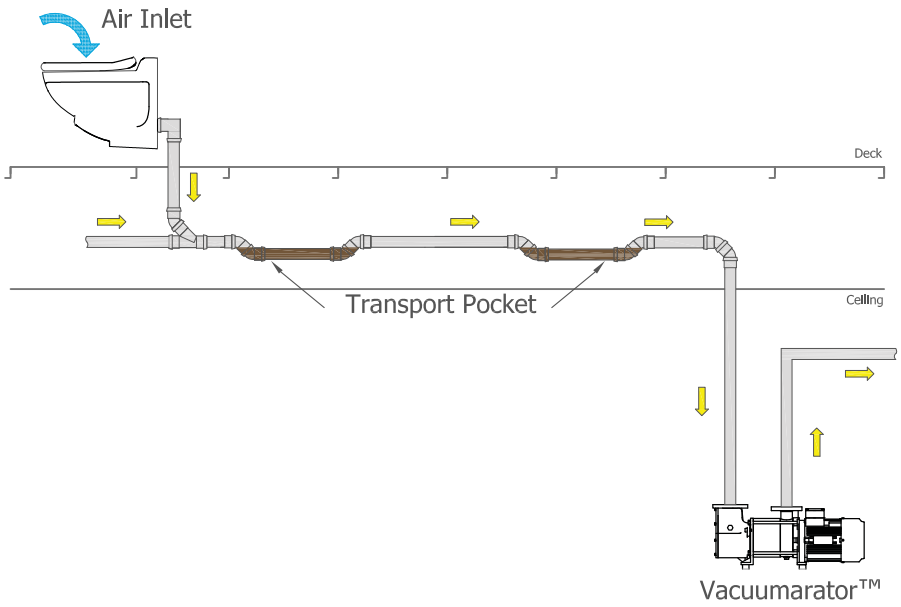
1. *A vacuum generating unit for producing vacuum.*
2. *A piping system for transport of sewage.*
3. *Toilets, urinals, grey water interface units etc. to let the sewage into the piping system.*

Difference in air pressure is used to transport sewage from toilets to a vacuum unit. In idle position there is 40 - 55% vacuum in the piping system. When flushing a toilet, air is let into the system. The content in the bowl is sucked into the piping together with 60 -80 liters of air. Water and effluent will form a slug. This slug will be sucked about 5 to 15 meter into the pipeline. The exact distance depends on the level of vacuum, dimension of the pipe, direction of flow, bends and other restrictions in the piping. When the toilet valve closes, the movement of the slug will stop, and the sewage will flow by gravity to the lowest point in the pipe. In order to have further transport, the slug must be re-formed.

By building transport pockets in the pipelines, the sewage will flow into the closest transport pocket. When next flushing of the toilet takes place, the sewage from one transport pocket will move to the next transport pocket simultaneous with emptying of the toilet, until reaching the vacuum generating unit. As a result of each toilet flushing, the vacuum level in the pipe system will decrease, and the vacuum generating unit will start and maintain the vacuum level in the pipe system.

When a toilet is flushed, 1 - 1,2 liters of sewage and 60 - 80 liters of air are sucked into the pipe. A perfectly installed pipe system will allow sewage to form slug in the transport pockets. The remaining part of the pipe will be empty and act as a vacuum reservoir.

During running, the Vacuumarator™ pump will macerate the sewage, generate vacuum and pump the sewage to the sewage treatment plant, collecting tank or elsewhere, all in one process.



3
Test Procedure and Acceptance Criteria

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Test Procedure Acceptance Criteria

3.0 Vacuum Pipes Only

Leakage test to be carried out of complete vacuum pipes, without any component, (toilets, grey water interfaces, vacuum unit etc.) connected.

All pipe ends to be blinded.

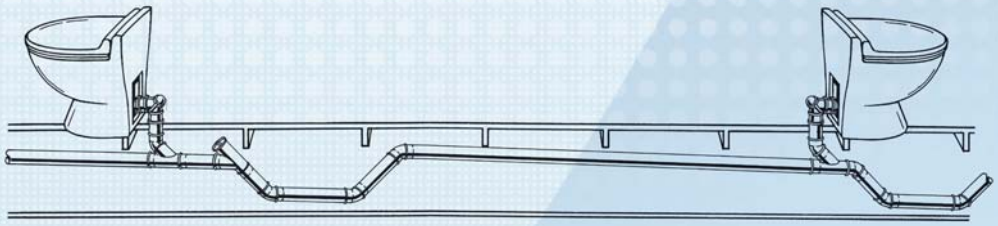
The maximum accepted leakage is: Vacuum drop from -0.55 bar to -0.45 bar during one hour.

3.1 Complete Vacuum System

Leakage test to be carried out of complete vacuum system, with all components (toilets, grey water interfaces, vacuum unit etc.) connected.

The maximum accepted leakage is: Vacuum drop from -0.55 bar to -0.4 bar over 20 minutes.

4
Design and Installation Guidelines- Downward Pipe Configuration



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4.0 Vacuum System Layout Downward

Outlet pipes from toilets should point downwards i.e. collecting pipes and branches should be on a lower level than the toilets. This means that when the toilet (wall mounted or floor mounted) is installed, the outlet should be connected to a horizontal branch beneath the deck.
The advantage of such a configuration is that the risk of backflow is eliminated and the outlet pipe from toilets to the collecting pipe branch will, in resting position, contain only air under vacuum and thereby ensure safe operation of the toilets. Sewage aggregated in the horizontal pipes due to change in trim or list, will not give any impact regarding the function of the toilet valves.
As a general rule however, each horizontal pipe should be as short as possible and connect to as few toilets as possible on each branch to maximize reliable function.

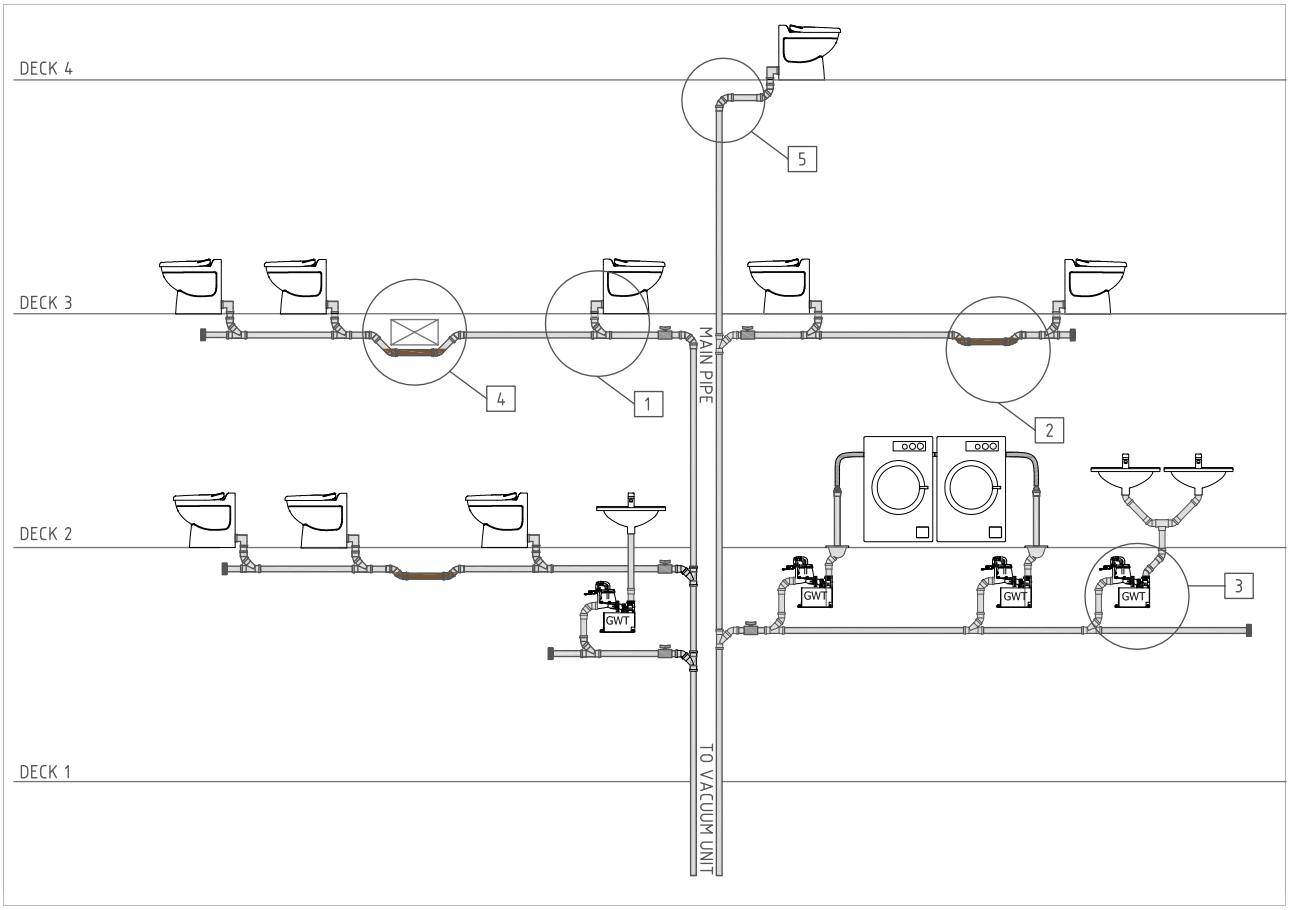
NOTE

Important to remember:

- Trim of the ship.
- Total length of the pipe branch.
- Slope.

Design and Installation Guidelines - Downward Pipe Configuration

4.1 The Optimal Vacuum System Layout



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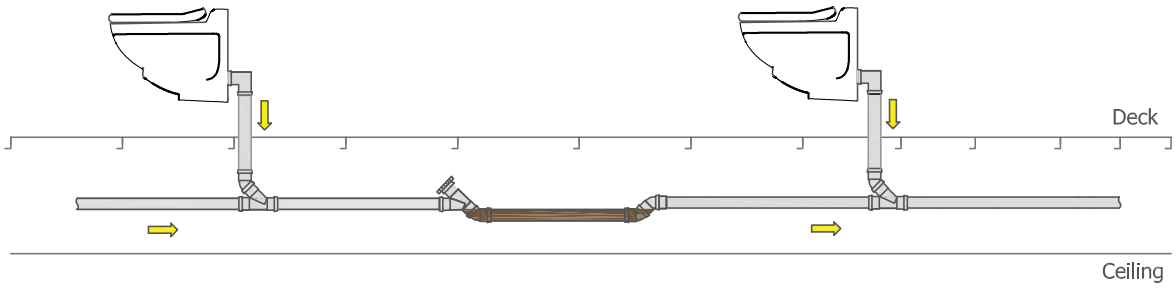
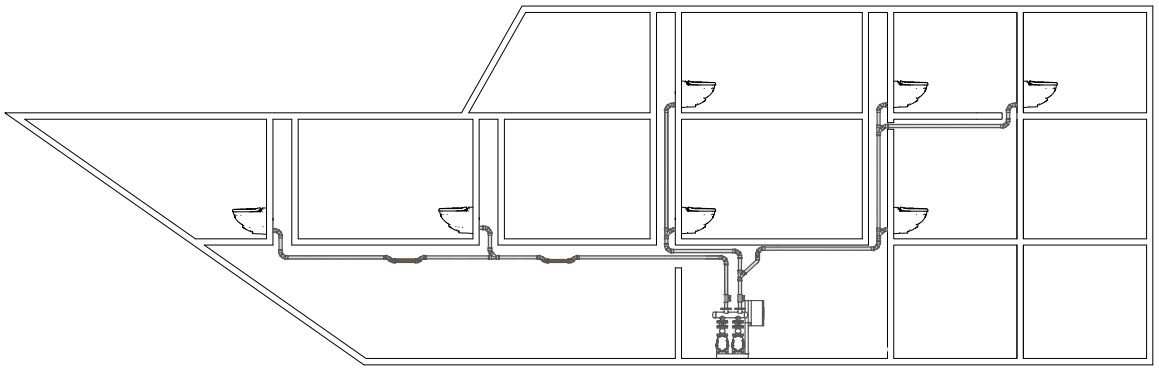
4.2 Choice of Piping Layout



4.2.1 Location of Vacuum Unit in Different Types of Ships

As a main rule the vacuum generating unit should always be located at the absolutely lowest point of the vacuum system. In addition, it should be located in such a way that main pipes and branches are as short as possible. Branch pipes from toilets should be routed in a downward direction towards the vacuum generating unit. In addition, the following must be considered when installing a vacuum piping system:

- The size of the ship.
- The risk of varying trim and list of the ship.



4.2.2 Vacuum Reservoir Calculation

The total vacuum reservoir is a result of the total pipe volume. When a toilet is flushed, 60 - 100 liters of air is let into the pipes. When the vacuum level drops with flushing of the toilets, the vacuum generating unit will start to rebuild the vacuum.

How far the vacuum level will drop and how often the vacuum generating unit will start is dependent on the total pipe volume.
To rebuild the vacuum will take anywhere from a few seconds to several minutes, depending on the pipe volume and capacity of the vacuum generating unit.

In cases of simultaneous flushing of multiple toilets (i.e. peak load on passenger vessels, ferries, etc.) the total pipe volume must be large enough support the systems function.
In vessels with a total pipe volume of less than 160 litres, we recommend increasing the vacuum reservoir by installing an accumulatingtank.

4.2.3 Vacuum Reservoir Balance

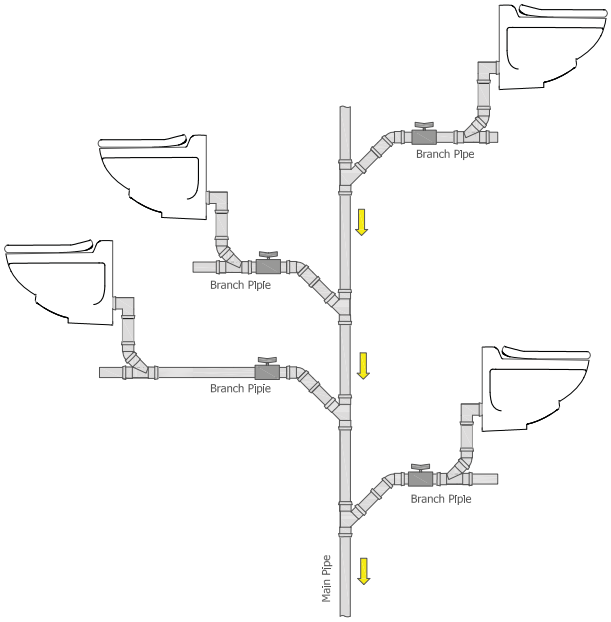
When a toilet is flushed, air is sucked into the pipe by the vacuum in the pipe system. From a toilet at the end of the pipe, the effluent will move towards the vacuum generator. However, when a toilet in the middle of the pipe is flushed, the vacuum reservoir towards the end of the pipe will cause some of the effluent to be sucked in the “wrong” direction. To minimize such problems, we recommend designing the system with short horizontal branches and reducing the number of toilets connected to each branch.

4.2.4 Choice of Branches

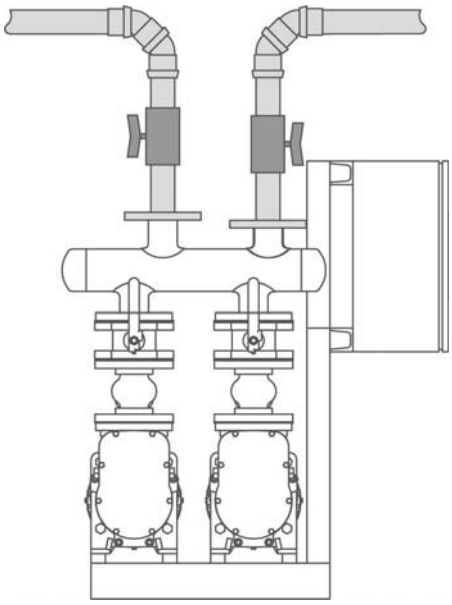
An optimally constructed piping system is designed to contain as little water as possible during ordinary operation. This is obtained by making horizontal pipes as short as possible and with as few bends as possible. Horizontal collecting pipes/main pipes should be located in a way that branches will be as short as possible.

Design and Installation Guidelines - Downward Pipe Configuration

4.2.5 Sectioning and Shut-off of Valves for Service

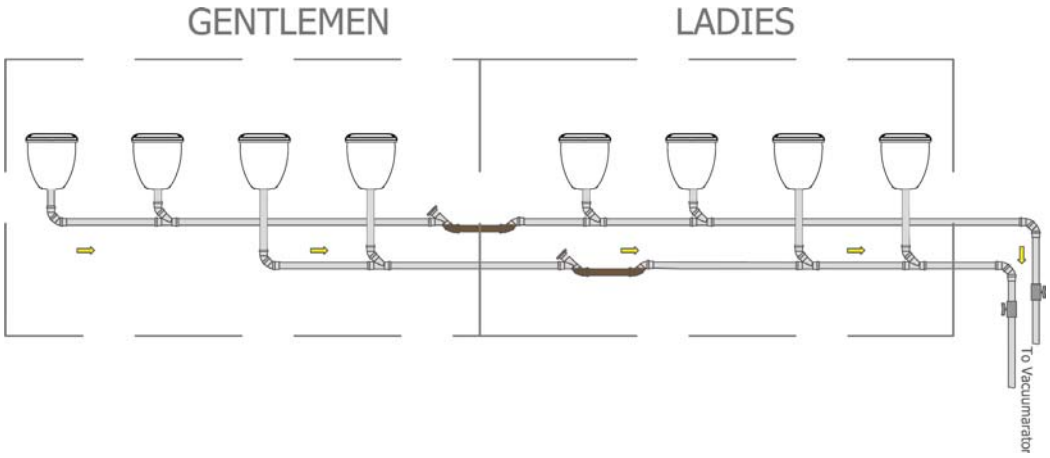


When deciding the number of main pipes from the vacuum generating unit to the branch points, the number of toilets, number of decks and the need for shutting-off service should be considered. If blockage or leakage in the vacuum pipes should occur, it is important to ensure that the remaining part of the system can still be utilized.



We recommend to install a minimum of two branch pipes from the vacuum unit manifold to the toilets. Each branch pipe should be installed with a shut-off valve for isolation in case of failure.

For passenger ships with public toilets, separate pipes should be installed to both ladies`and gentlemen`s toilets. The purpose is to maintain operation (of ladies` or gentlemen`s) toilets in case of blocking or leakage in one line.

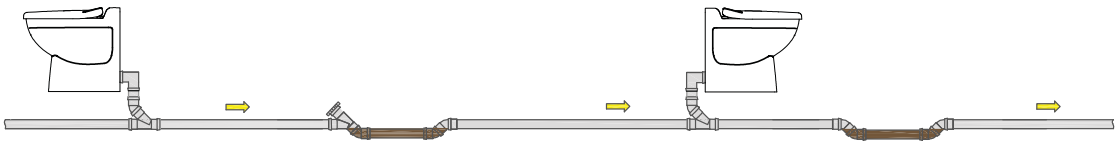


4.3 Horizontal Pipes

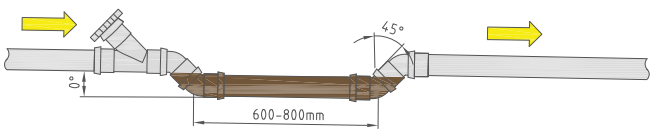
4.3.1 Transport in Horizontal Pipes

Downward directed outlet pipes from toilets:

The pipes may be mounted horizontally between the transport pockets, provided that the outlet pipes from toilets have a downward direction, and hence backflow is prevented.



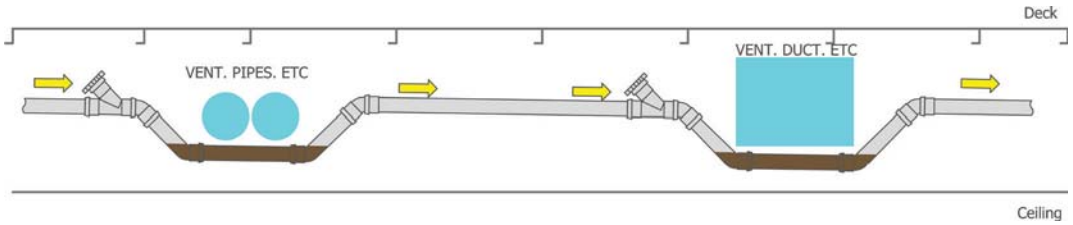
4.3.2 Transport Pocket



Transport pockets are made to re-form slugs. When a toilet on the same pipeline is flushed, the pressure difference in front of and at the back of the pocket will “push” the slug on to the next pocket.

Design and Installation Guidelines - Downward Pipe Configuration

When passing obstructions (ie. crossing ventilation ducts, crossing pipes and etc.), it is advantageous to construct the passing as a transport pocket.

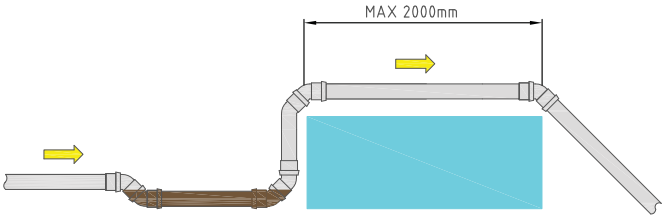


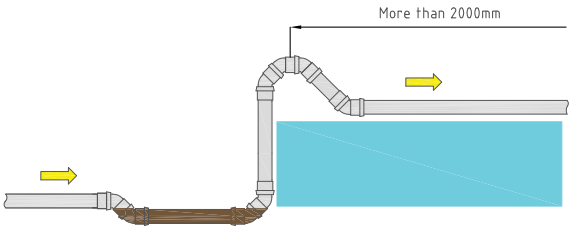
The distance between transport pockets should be decided considering the risk of change in trim and list of the vessel, and the ship's movement due to sea conditions.

Recommended Distances Between Transport Pockets:

Vessel type	Distance
Fishing vessels	5 meters
Other vessels: cargo ships, container vessels and the like	10 meters
Large passenger vessels	15 meters

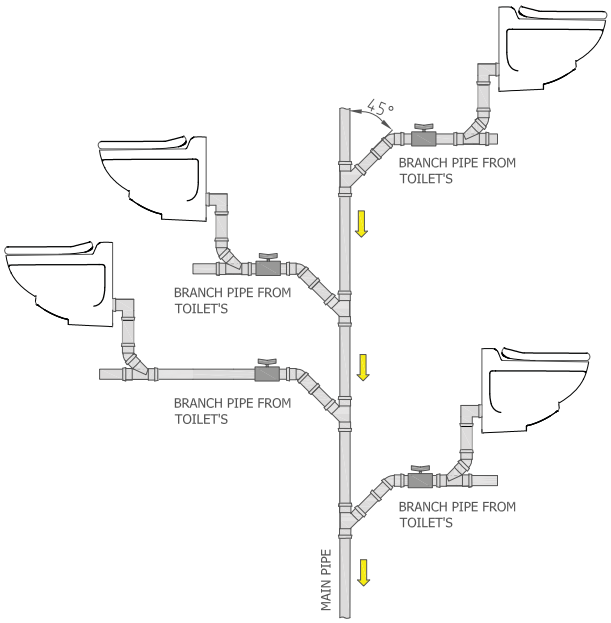
For systems with downward directed outlet pipes from toilets to horizontal pipe branches, the distance between transport pockets should not exceed 25 meters.





If the vacuum pipe must to be placed above obstructions, it is important to place a transport pocket in front of the rising pipe. In this way maximum speed of the transported sewage is obtained in the rising pipe.
If the horizontal pipe at the higher level exceeds 2000mm a gooseneck must be installed to prevent backflow.

4.4 Pipe Connections

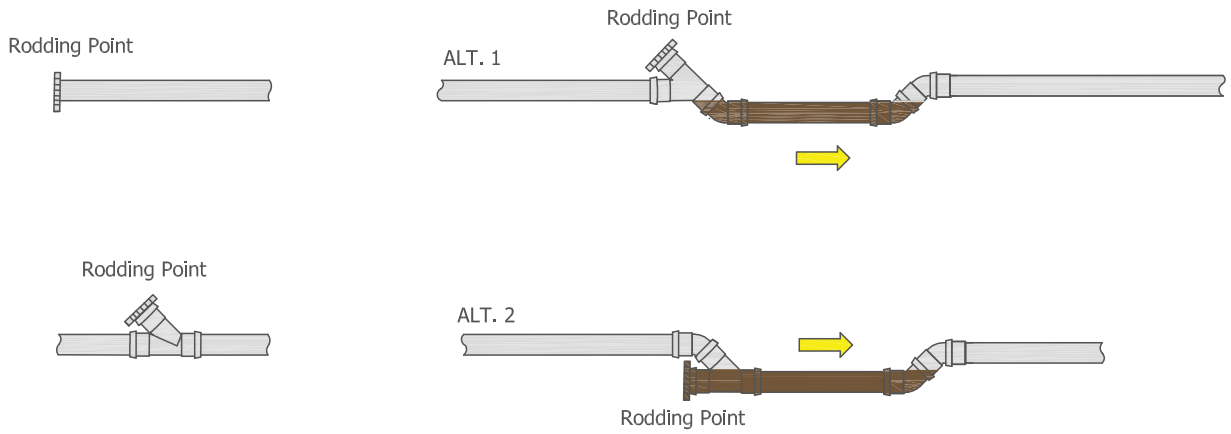


The number of toilets connected to branches and collecting pipes will decide the pipe dimensions. The most commonly used dimension for pipes from toilets, and also from branches is DN50 for multiple of toilets (up to 20-25 toilets). For collecting pipes exceeding 25 toilet connections, DN65 is to be used.

Connection of horizontal branches to downward carried out collecting pipes should always be done with a downward 45º bend connection. In larger systems we recommend shut-off valves for each branch. Remember to include sufficient access to shut-off valves.

4.4.1 Rodding Points

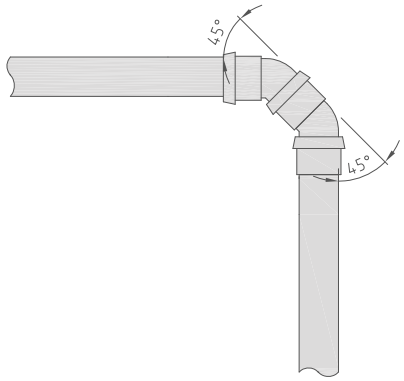
Rodding points should be installed with suitable distances and sufficient access. In longer stretches of pipe, installation of the rodding points can occur in connection with transport pockets.



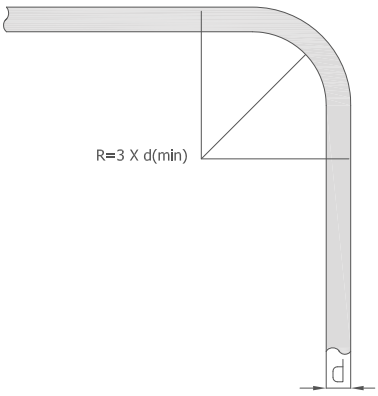
Design and Installation Guidelines - Downward Pipe Configuration

4.4.2 Bends

Bends are to be made with a large radius of curvature.



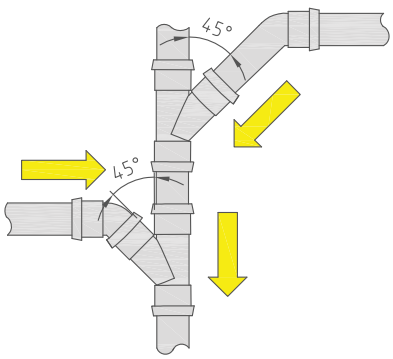
For plastic pipes and steel “push-fit” pipes the minimum radius is to be 2 x D, or a 90° bend made of two 45° bend pieces.

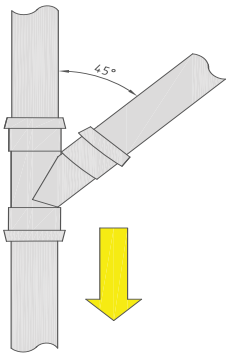


For welded steel pipes, the minimum bend radius must be 3 x D. The inside of the pipes and fittings is to be smooth and without obstructions to avoid clogging.

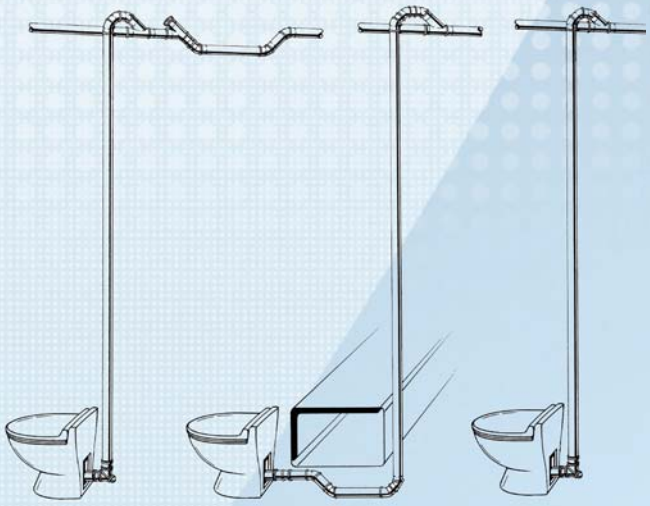
4.4.3 Branches

Connecting of pipes is to be made at a maximum angle of 45º in the direction of transport. T-pipes are not to be used. Branch pipes are always to be connected to horizontal main pipes from above. Branch pipes are always to be connected to vertical main pipes at an angle of 45º.





5
Design and Installation Guidelines- Upward Pipe Configuration



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5.0 System with Lift from Toilets

Our general recommendation is (as stated in 4.0) is that toilets should be installed above pipework in the toilet system. On occasion this is not possible. One of the advantages with a vacuum system, is that it is also possible to vacuum waste water in an upward flow. Jets™ system can be designed to vacuum waste upward (one deck) from a toilet to a from a toilet to a horizontal pipe located below the deck above. When installing in this manner correct pipe installation layout are vital. This is due to upward lift dramatically increasing the risk for backflow. This arrangement also places much higher strain on the system in general.

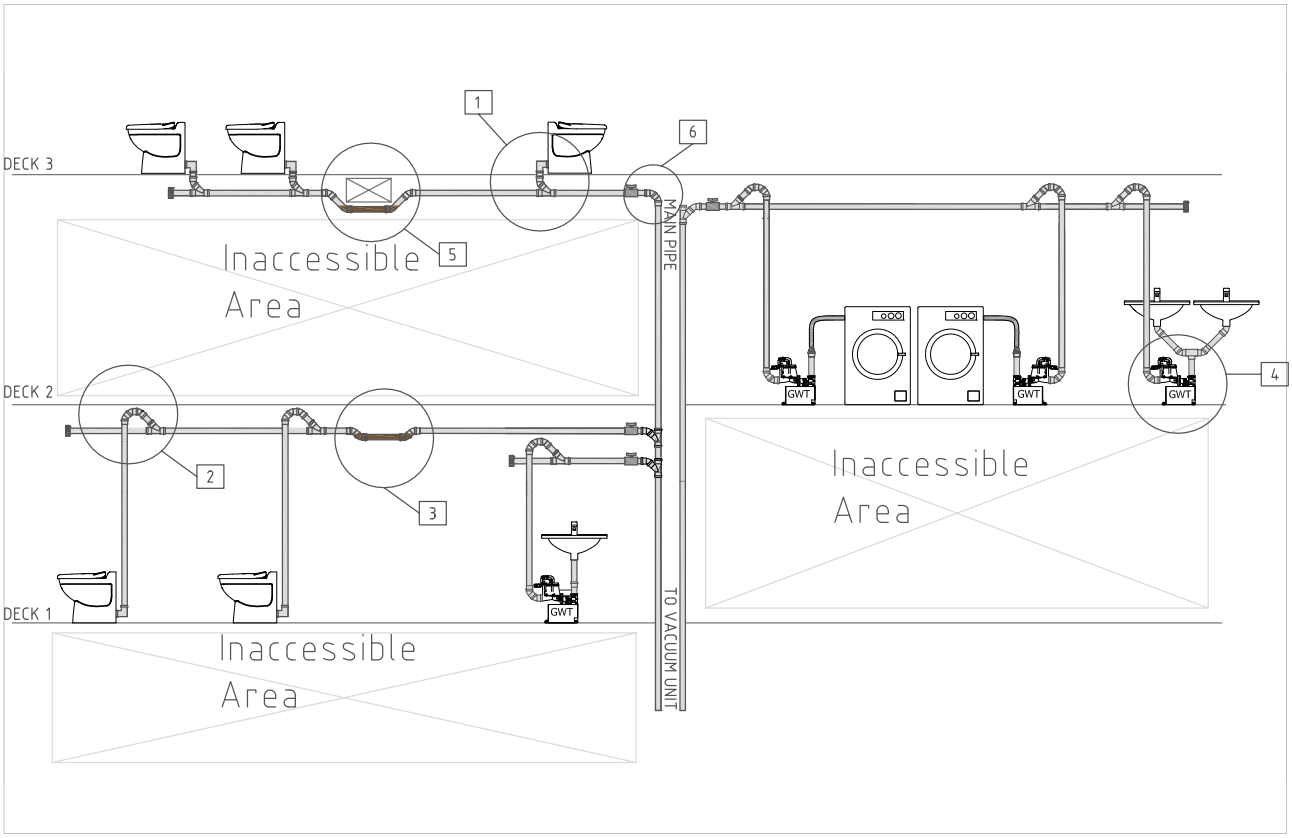
NOTE

Important to remember:

- Trim of the ship.
- Total length of the pipe branch.
- Slope.

Design and Installation Guidelines - Upward Pipe Configuration

5.1 Vacuum System Layout, Upward



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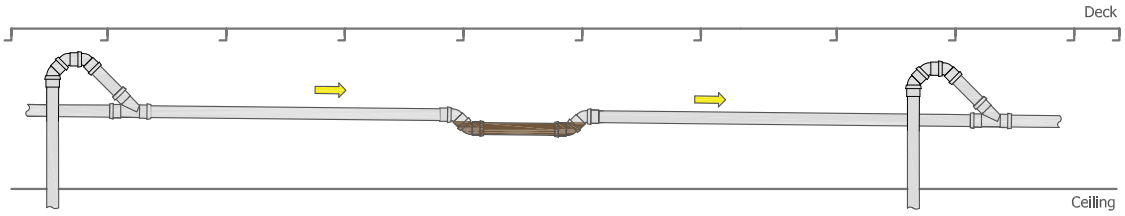
Design and Installation Guidelines - Upward Pipe Configuration

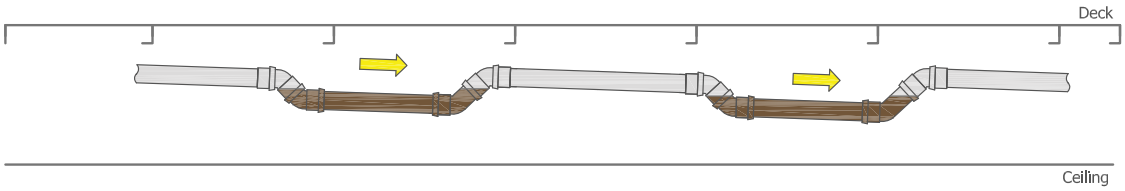
If a downward layout of outlet pipes from the toilets is not possible, each toilet may be connected to horizontal pipes in the ceiling. If this solution is chosen, correct layout of the vacuum piping is vital.

This is achieved by:

1. Horizontal pipes are to be installed with a minimum number of bends, and the number of transport pockets as recommended for the type of ship.
2. Horizontal branch pipes are to be as short as possible.
3. Vertical collection pipes must be installed so as to avoid undesired waterlocks towards the vacuum generating unit.
4. The vacuum generating unit is to be located at the lowest point of the vacuum system, and also in a central position in relation to the piping system.

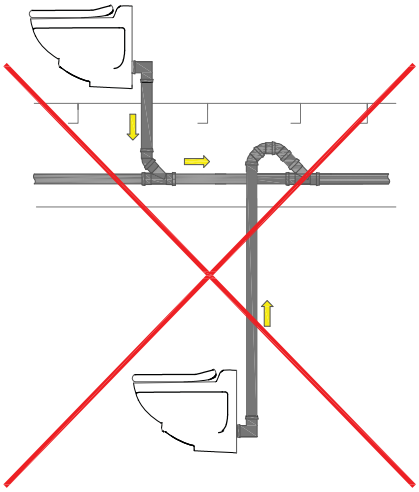


It is preferable that vacuum pipes be mounted with a slope between the transport pockets in the flow direction.



At transverse sections of vacuum piping, distance between transport pockets should be considered separately. Even for large vessels, length of transverse sections may require reduced distance between transport pockets. Bends in pipe lines will always obstruct the flow. In horizontal lines, bends will cause an accumulation of sewage just after the bend. It is therefore recommended to install a transport pocket just after such a bend to collect the sewage and thereby obtain maximum flow speed at the next straight section. When several bends are located close to each other, a transport pocket should be located just after the last bend in the flow direction. It is recommended to install transport pockets just after branch connections in the flow direction.

5.1.1 Mounting of Vacuum Pipes in Ceilings



In many installations the horizontal branch pipes are mounted in the ceiling between the overlaying deck and the paneled ceiling. As a consequence, toilet outlets are connected to a vertical pipe, which in turn is connected to a horizontal branch pipe in the ceiling.

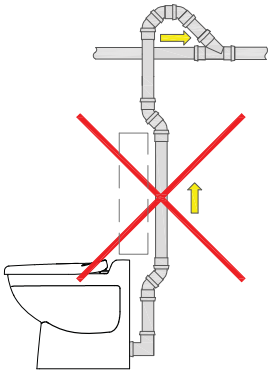
The greatest challenge in such cases is to avoid back-flow to the toilets. Backflow is when sewage from upper pipes flows back to the rising pipe connected to the toilet. If this rising pipe is filled with sewage, it will influence the discharge function, and in the worst case, cause sewage to flow into the toilet bowl.

5.2 Connection to Vacuum Main Branch

5.2.1 Rising Pipes from Toilets

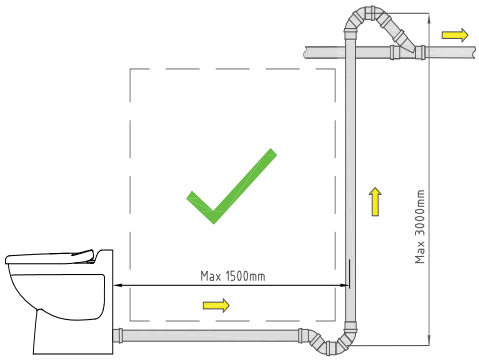
NOTE

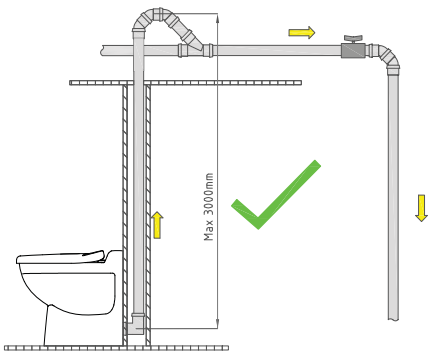
Bends are not allowed on rising pipes.



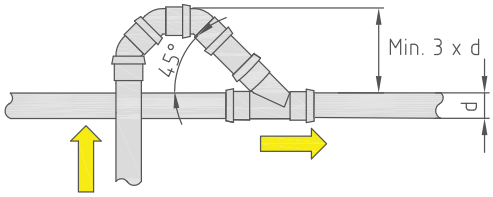
Vertical pipe connections are to be straight running with no bends, to obtain the best possible transport out from the toilet.

If there is an obstruction behind the toilet, the rising pipe can be a maximum of 1500mm from the toilet. A transport pocket must be located just before the rising pipe.





5.2.2 Gooseneck



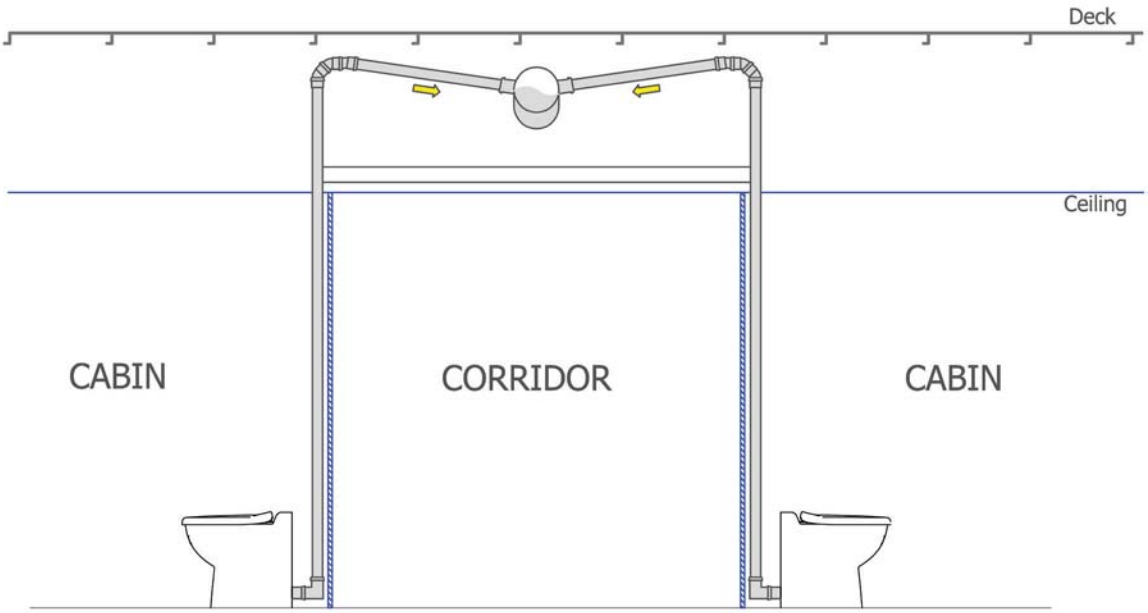
The rising pipe is to be connected to the upper side of the horizontal branch pipe with a gooseneck at an angle of 45° in the direction of flow. The of gooseneck is to be installed at a minimum height of 3 x the diameter of the pipe.

5.2.3 Connection to the Horizontal Branch Pipe

The rising pipe from a toilet must never be connected to a point on a horizontal branch pipe that may be filled with water, i.e. at a low level point of the pipe line.

The reason for this is that in case of low vacuum in the horizontal branch pipes, water may be sucked through the gooseneck and gradually the rising pipe will be filled with sewage.

In corridors where rising pipes from toilets on both sides are connected to a common branch pipe, the rising pipe should go as high up as possible and then point downwards towards the branch pipe.



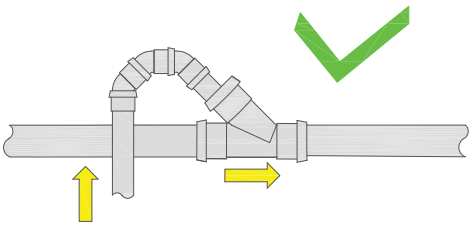
5.2.4 Mounting of Horizontal Branch Pipes in Paneled Ceilings

Horizontal branch pipes between overlaying decks and paneleds ceiling are to be placed as close to the paneled ceiling as possible, i.e. transport pockets are to form lower boundary layers towards the ceiling. In this way, maximum space for the gooseneck in the joint between the rising pipe from toilet to the horizontal pipe is obtained.

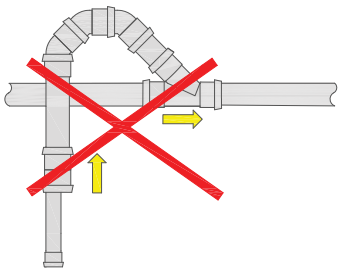
5.2.5 Joining of Pipes with Different Dimensions

The number of toilets connected to branches and collecting pipes will decide the pipe dimension. The most commonly used dimension for pipes from toilets, and also from branches is DN50 for multiple toilets (up to 20- 25 toilets).

For collecting pipes exceeding 25 toilet connections, DN 65 is used.
Important note: rising pipes with vacuum transport from lower to higher levels must never be installed with transitions to larger dimensions of pipe.



Correct



Incorrect

The reason for this is that larger dimensions of pipe create less speed of air and consequently slower transport and shorter distances of transport. The consequences of this are increased risk of build-up of sewage and thereby backflow.

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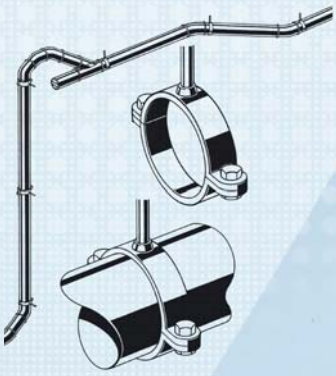
6
General Piping Installation Guidelines



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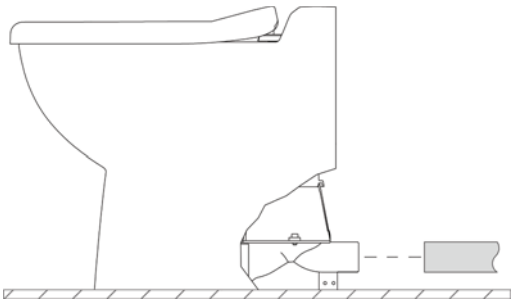
General Piping Installation Guidelines

6.0 Toilet Connections

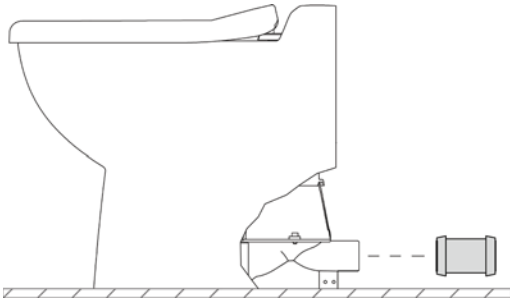
6.0.1 Alignment of Pipe to Toilet Valve

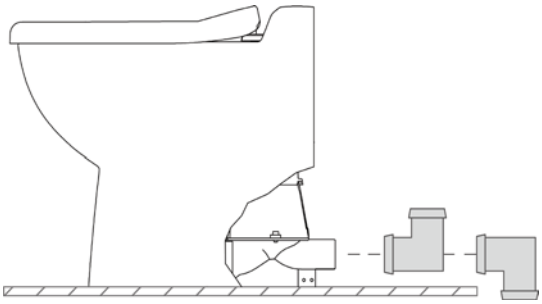


To avoid leakage between the toilet valve and the toilet bowl, it is important that the pipe is properly aligned.

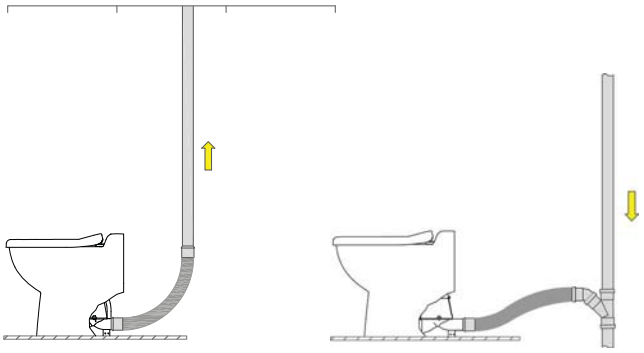
6.0.2 Connection to the Toilet Valve

The rubber sleeve and elbow are to be secured with hose clamps.





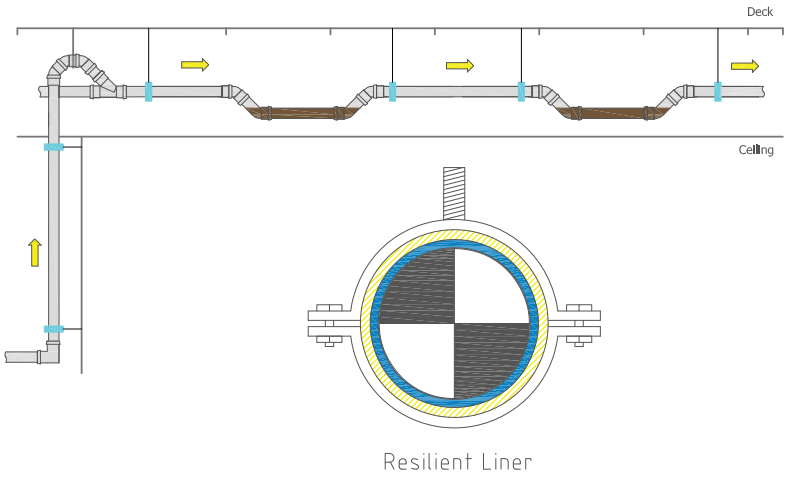
6.0.3 Flexible Hose



- When flexible hoses connecting pipes and toilets are used, the flexible hose should be as short as possible.
- The distance between the toilet outlet and the pipe system must not exceed 70% of the total length of the hose.
- The flexible hose is to be secured with hose clamps.

General Piping Installation Guidelines

6.1 Pipe Clamps

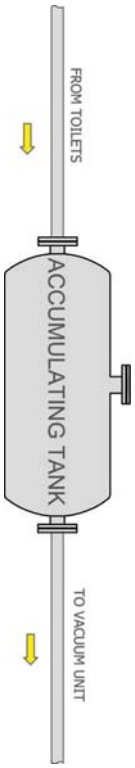


The followint pipes are to with secured according to clamps by recommendation from the pipe supplier:

- Change of direction
- Vertical piping
- After connection of a toilet or other equipment
- Every 1,5 m or every 2nd. frame for plastic pipes.
- Every 2,0 m for DN 40 steel pipe
- Every 2,3 m for DN 50 steel pipe
- Every 2,7 m for DN 65 steel pipe

6.2 Vacuum Accumulating Tank

For small vacuum systems (up to approx.10 toilets), a vacuum accumulating tank must be considered.

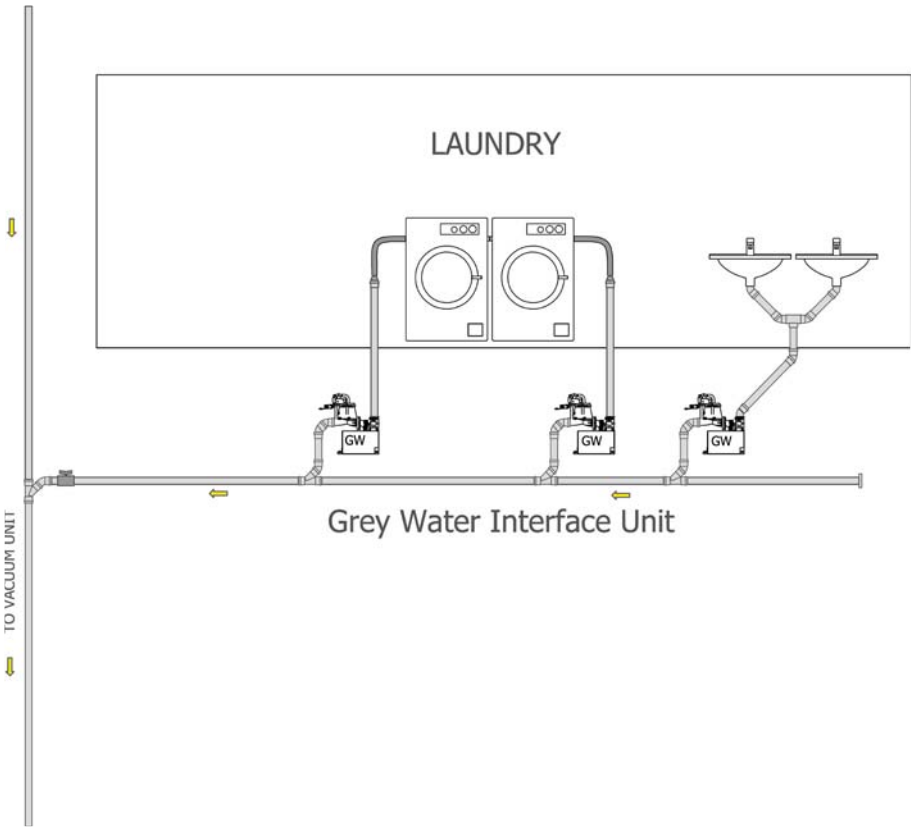


An accumulating tank is recommended if the total pipe volume is less than 160 L
(equal to approx.85 m pipe length DN50).

6.3 Grey Water Interface Unit

6.3.1 Grey Water in Vacuum Sewage Systems.

Grey water system are normally designed for gravity flow and separated from the vacuum sewage system. This is because the volume of grey water is normally much higher than black water, and it is treated separately or collected in separate collecting tanks. However, in special situations, it might be desired that grey water be fed into the black water system.



Reasons may include circumstances where it is impossible to install gravity pipes in a specific area or the grey water volume is so limited that feeding into the black water system is accepted. When grey water fed into the black water system is considered, the risk of negative aspects of cleaning detergents must be acknowledged.

Soapy water may create foaming in vacuum pumps and disinfection detergents such as chlorine etc. may harm the sewage treatment process. To feed grey water into a vacuum system, a grey water interface unit must be installed. The grey water interface unit (typical size 8,16 liter) includes an interface valve (ED valve) built on the tank. The valve is automatically operated by a level sensor in the tank which activates the ED valve to feed the grey water into the vacuum pipe.

6.3.2 Grey Water Interface Unit

Normally, grey water is be led in separate gravity pipe lines to a sewage treatment plant or collecting tank.

However, in cases where the grey water must be connected to the ship's vacuum system, this can be done by installing a grey water unit with interface (ED valve) to the vacuum system.

General Piping Installation Guidelines

6.4 Pipe tables

Table 1 - Materials

Material:	PEH	PVC	Steel	Stainless steel
Use:	Accomodation up to 75 mm (DN 65)	Accomodation up to 75 mm (DN 65)	In engine room or other heat - producing areas. Sizes above DN 65/80 to be used*	In accomodation and engine room
Minimum Pressure Rating:	PN 10	PN 10	PN 10	PN 10

PEH = High Density Polyethylene. PVC = Polyvinylchlorine, e.g. DIN 86013.

NOTE

- Plastic pipes do not resist temperatures above 60° C under vacuum conditions.
- Steel pipes are to be galvanized.
- Reguirements of all national authorities and classification societies must be met.

Table 2 – Number of Vacuum Toilets

Number of vacuum toilets	Minimum pipe size				
	Connection DN	PEH d x s (mm)	PVC d x s (mm)	Steel d x s (mm)	Stainless steel d x s (mm)
0 - 3	40	50 x 3.0	50 x 2.4	48.3 x 2.6	50 x 1.0
4 - 25	50	63 x 5.8	63 x 3.0	60.3 x 2.9	50 x 1.0
26 - 100	65	75 x 6.9	75 x 3.6	76.1 x 2.9	75 x 1
	For installations exceeding 100 toilets, Jets AS is to be contacted.				

d = outside diameter. s = wall thickness.

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7
Descaling and Cleaning of Vacuum Sewage Pipelines

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7.0 Jets™ Descale

It is recommended to start with Jets™ Descale / Toilet Clean on all new buildings.
Urine scale is a hard substance that arises due to chemical reaction between the calcium in the water and the urine. Without any action taken a build-up of scale in the vacuum pipes will sooner or later occur depending on several factors. The temperature, the content of calcium in the fresh water and the frequency of use of the toilets are factors which decide the rapidity of the scale build-up. In order to avoid scale build-up, it is recommended to follow the Jets™ descaling program. The Jets™ descaling program provides treatment for 4 different scenarios:

1. The Jets™ descale maintenance program offers treatment to clean pipes in order to avoid new scale build-up.
2. The Jets™ descale program offers treatment to minor scale build-up and is carried out over a longer period of time.
3. The Jets™ descale boosting programme offers treatment to severe scale build-up where immediate action is necessary (see datasheet 813398).
4. Strong acid treatment is recommended to remove extremely severe scale build-up. This requires that the toilets be disconnected and the pipes plugged (can be carried out in the repair yard).

    a. Fill up the pipe line with a liquid mixture of phosphoric acid and water (10% acid and 90% water).
    b. Arrange circulation of the mixture if possible. Keep the circulation running for 24 hours
    c. Flush out with water.

The Jets™ descaling programmes allow running toilets during processes 1-3. It is therefore not necessary to disconnect the toilets or plug the pipes during the descaling process.

Jets AS recommend 2 options:

1. Manual dosing: Poor the Jets™ descaling liquid directly into the toilets according to Jets™ recommended dosing program.
2. Automatic dosing: Dosing units to be installed in the vessel according to Jets™ recommendations.

It is highly recommended to follow Jets™ recommendations accurately in order to obtain maximum effect.

Please contact Jets AS to arrange a dosing program adapted specifically for to your vessel.

Jets™ Toilet Clean / Jets™ Descale

Principle & Function

Use of JetsTM Toilet Clean in New Toilet Systems

JetsTM Toilet Clean may be used like any ordinary cleansing agent for cleaning the toilet bowl. If desired, all standard bathroom equipment may be cleaned with JetsTM Toilet Clean. After applying, flush the toilet as usual. The flushing water will dissolve existing layers of scale and prevent accumulation of scale in new toilet systems. JetsTM recommend using one (1) liter of Toilet Clean per 70 to 100 toilets, depending on the amount of cleaning required.

Dosing Directly into the Main Branch via an Automatic Dosing Unit

For automatic dosing, it is necessary to determine the number of toilets covered by the dosing unit. Calculate 1cl JetsTM Descale per toilet, twice during a 24 hour period. If the dosing unit covers 50 toilets the calculation will be as follows: 50cl (½ liter) x 2 = 1 liter per 24 hours. Using this information, the system may be set to automatic dosing for a period of 24 hours with dosing occurring at regular intervals as frequently as deemed necessary (i.e. 1dl 10 times per 24 hours or 4,2cl every hour or 0,5 liter twice per 24 hours). Dosing at frequent intervals with small doses is preferable and the most effective means of cleaning.
We recommend 4,2cl per hour.

Dosing by Adding JetsTM Descale Directly into the Toilet

To calculate dosing requirements when dosing directly into the toilet, apply the same recommendations as when using an automatic dosing unit. In addition, 2cl of Descale may be added when cleaning the toilet. If dosing in a multiple toilet system, and Descale is to be added via one toilet only, select the toilet with the longest distance from the vacuumarator. Calculate the quantity of Descale required using the previous recommendations (i.e. if there are 50 toilets in the system, the total amount of JetsTM Toilet Clean will be 1 liter per 24 hours). Remember that by using a dosing unit or by dosing directly into one toilet, only the main branch will be cleaned and not the outlet pipes from each toilet (as when applying Toilet Clean to each individual toilet). We recommend that JetsTM Toilet Clean be used for all installations (both new and old toilet systems).

Shutdown and Cleaning by Circulating Jets™ Descale (Boosting Program)

Please contact Jets AS Service Department. We cooperate with Norse Oilfield Services, leaders in environmental solutions. For our boosting program, special pumps, parts and tools are required. If desired, Jets AS can arrange training courses for maintenance personnel.

The optimal effect of JetsTM Descale is obtained by dosing so as to ensure that the cleansing agent remains in the pipes for as long as possible. Applying Descale directly into the toilet should be carried out at times when toilet use is infrequent (e.g. at night). By applying a dosing unit, the effects of JetsTM Descale are optimized. By dosing a small amount once every hour the effect is maximized.

Note: Changes without prior notice

Descaling and Cleaning of Vacuum Sewage Pipelines

7.1 Jets™ Toilet Clean

7.1.1 Use of Jets™ Toilet Clean for New Systems

For cleaning and disinfection of toilets, urinals and wash basins. Toilet Clean may be used like any ordinary cleansing agent for cleaning of the toilet bowl. If desired all bathroom equipment may be cleaned with Jets™ Toilet Clean. After applying, flush the toilet as usual, and the flushed–down water will resolve exisiting layer or prevent accumulation of layers in new systems. Normally 1 liter will be sufficient for 70 – 100 toilets, depending on the amount of cleaner applied. It is designed to work over time to prevent scale build-up or remove scale that is just starting to form. At the same time it effectively disinfects the sanitary system. See safety sheet.

7.2 Jets™ Dosing Unit

In order to get the most efficiency out of the liquid, smaller and for more frequent dosages, the automatic dosing pump Jets™ Dosing Unit is a good solution. The dosing pump can be fitted directly on the 5ltr and 25ltr. canister. It gives the precise amount of Jets™ Descale every time. Easy to adjust for numbers of toilets. We recommend one pump at the end of each pipeline. For large passenger vessels we have pumps with multiple outlets.

7.2.1 Dosing directly into the main branch via an automatic dosing unit.

Determine the number of toilets covered by the dosing unit. Calculate 1cl. Jets™ Descale per. toilet twice during 24 hours.
If the dosing unit covers 50 toilets this will be 50cl.
(½ liter) x 2 = 1 liter per 24 hours.
In principle you may now set the dosing for 24 hours as often as desired.
E.g. 1dl 10 times per 24 hours or 4,2cl. every hour or 0,5 liter twice per 24 hours. As many small dosages will be most efficient, we recommend 4,2cl. per hour.